

EXECUTIVE SUMMARY

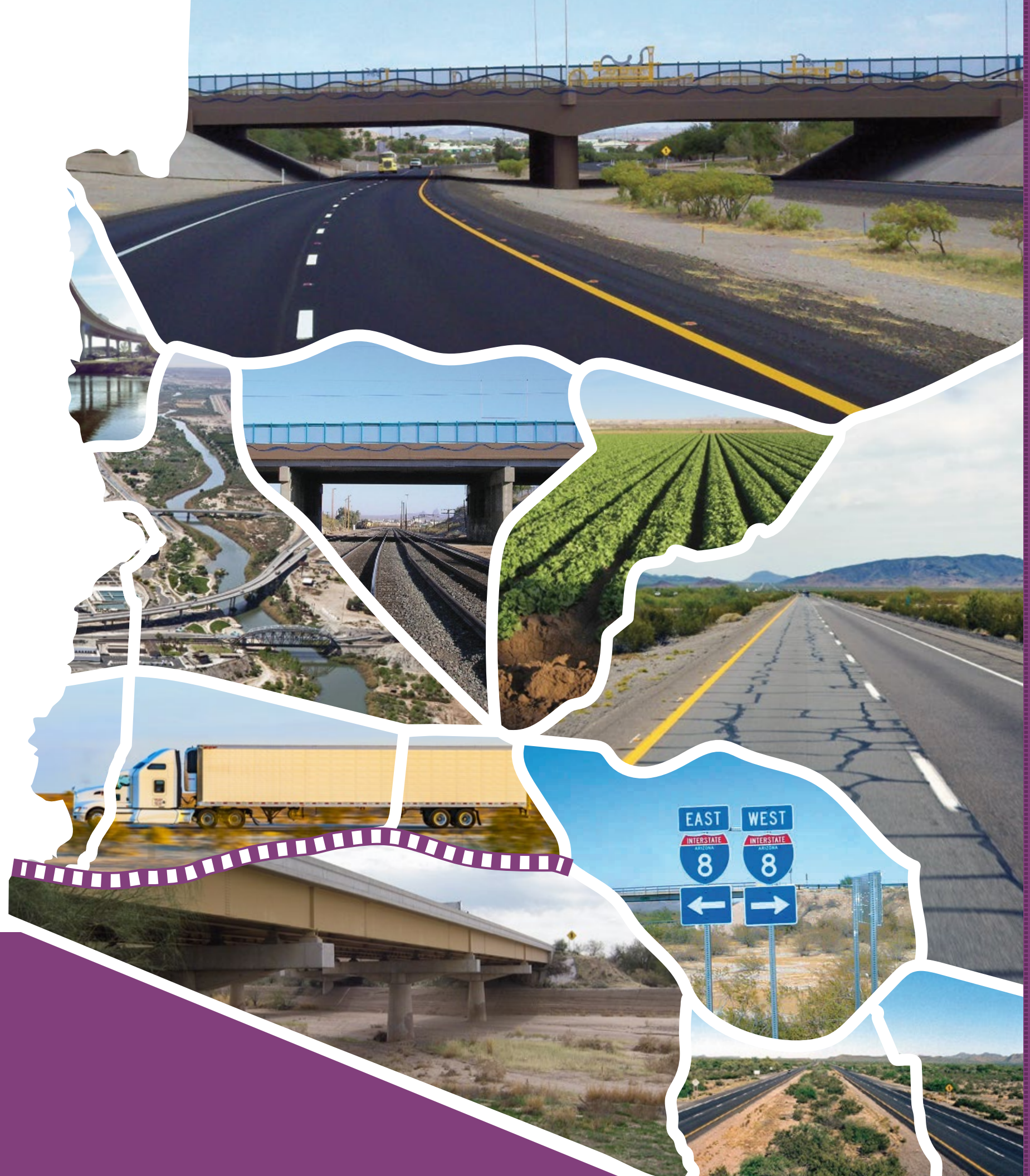
Arizona/California State Line to Junction I-10

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EXECUTIVE SUMMARY

INTRODUCTION

The Arizona Department of Transportation (ADOT) is the lead agency for this Corridor Profile Study (CPS) of Interstate 8 (I-8) between the California Border and the Interstate 10 (I-10) Junction. This study examines key performance measures relative to the I-8 corridor, and the results of this performance evaluation are used to identify potential strategic improvements. The intent of the corridor profile program, and of ADOT’s Planning-to-Programming (P2P) process, is to conduct performance-based planning to identify areas of need and make the most efficient use of available funding to provide an efficient transportation network.

ADOT is conducting eleven corridor profile studies within three separate groupings. The I-8 corridor, depicted in **Figure ES-1**, is one of the strategic statewide corridors identified and the subject of this CPS.

Corridor Study Purpose, Goals, and Objectives

The purpose of the CPS is to measure corridor performance to inform the development of strategic solutions that are cost-effective and account for potential risks. It is accomplished by following the process described below:

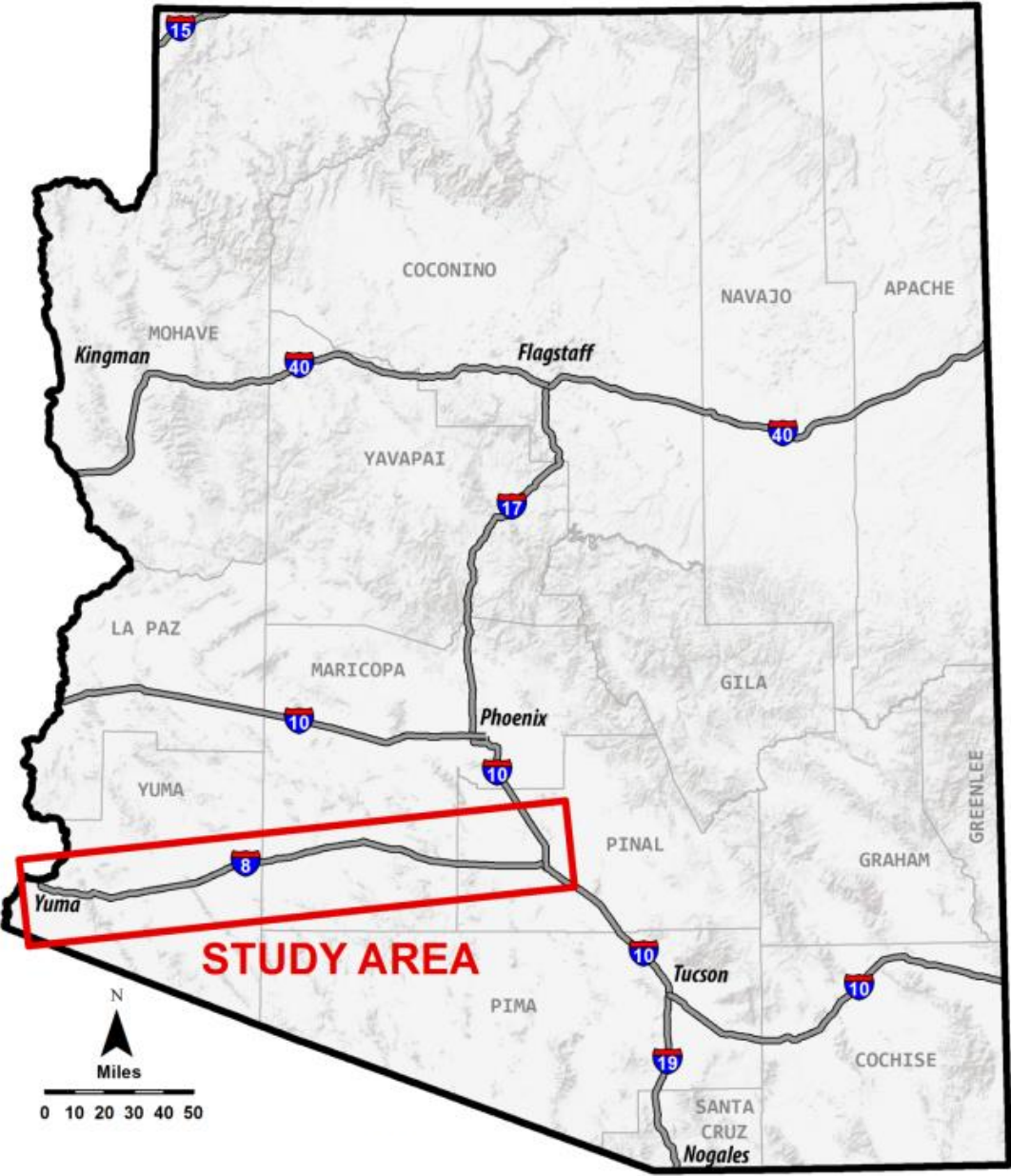
- Inventory past improvement recommendations
- Define corridor goals and objectives
- Assess existing performance based on quantifiable performance measures
- Propose various solutions to improve corridor performance
- Identify specific solutions that can provide quantifiable benefits relative to the performance measures
- Prioritize solutions for future implementation, accounting for performance effectiveness, and risk analysis findings

The objective of the I-8 CPS is to identify a recommended set of prioritized potential solutions for consideration in future construction programs, derived from a transparent, defensible, logical, and replicable process. The I-8 CPS defines solutions and improvements for the corridor that are evaluated and ranked to determine which investments offer the greatest benefit to the corridor in terms of enhancing performance.

The following goals are identified as the outcome of this study:

- Link project decision-making and investments on key corridors to strategic goals
- Develop solutions that address identified corridor needs based on measured performance
- Prioritize improvements that cost-effectively preserve, modernize, and expand transportation infrastructure

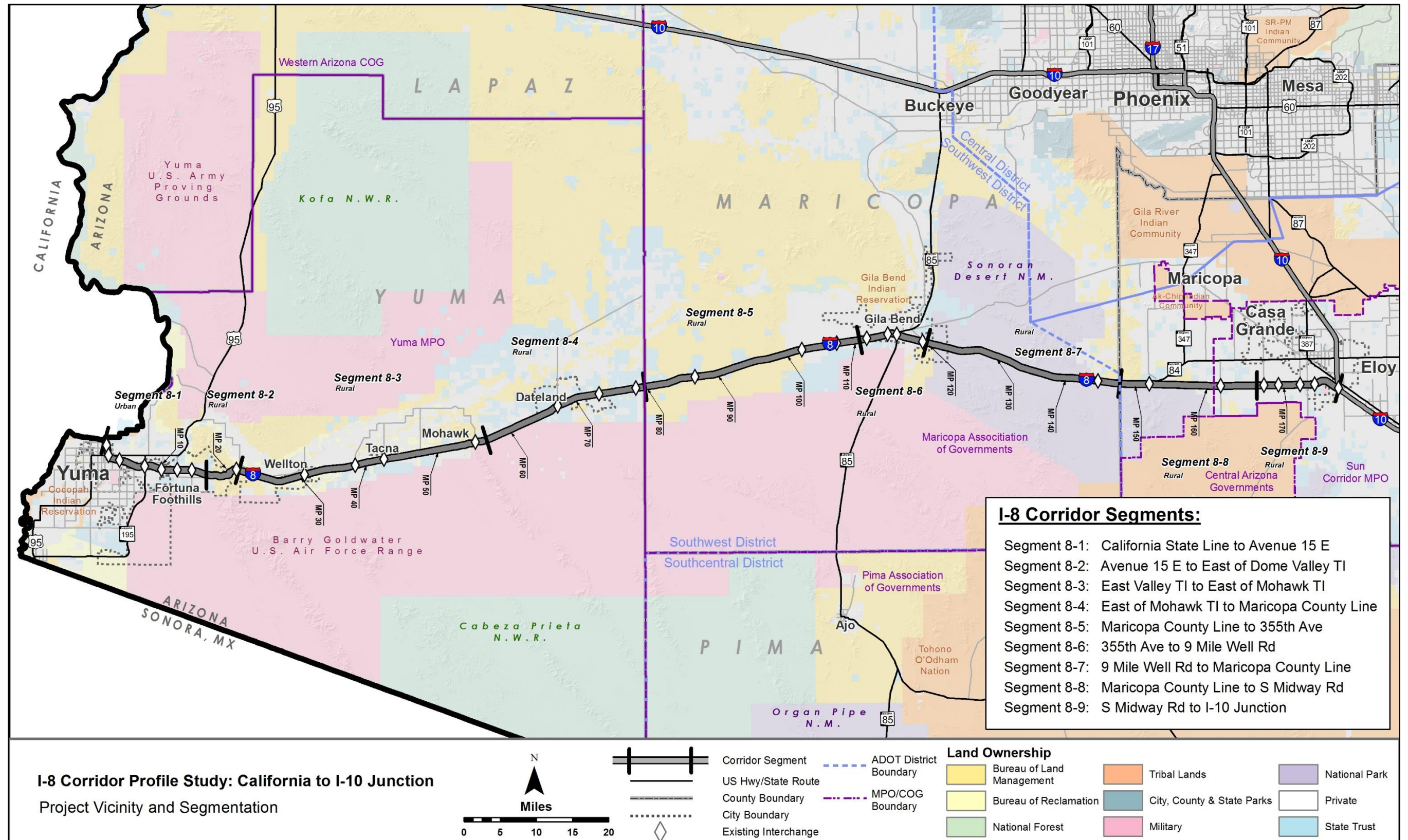
Figure ES-1: Corridor Study Area



Study Location and Corridor Segments

The I-8 CPS utilizes nine planning segments to facilitate analysis and evaluation. The corridor is segmented at logical breaks where the context changes due to differences in characteristics such as terrain, daily traffic volumes, or roadway typical sections. Corridor segments are shown in **Figure ES-2**.

Figure ES-2: Corridor Location and Segments



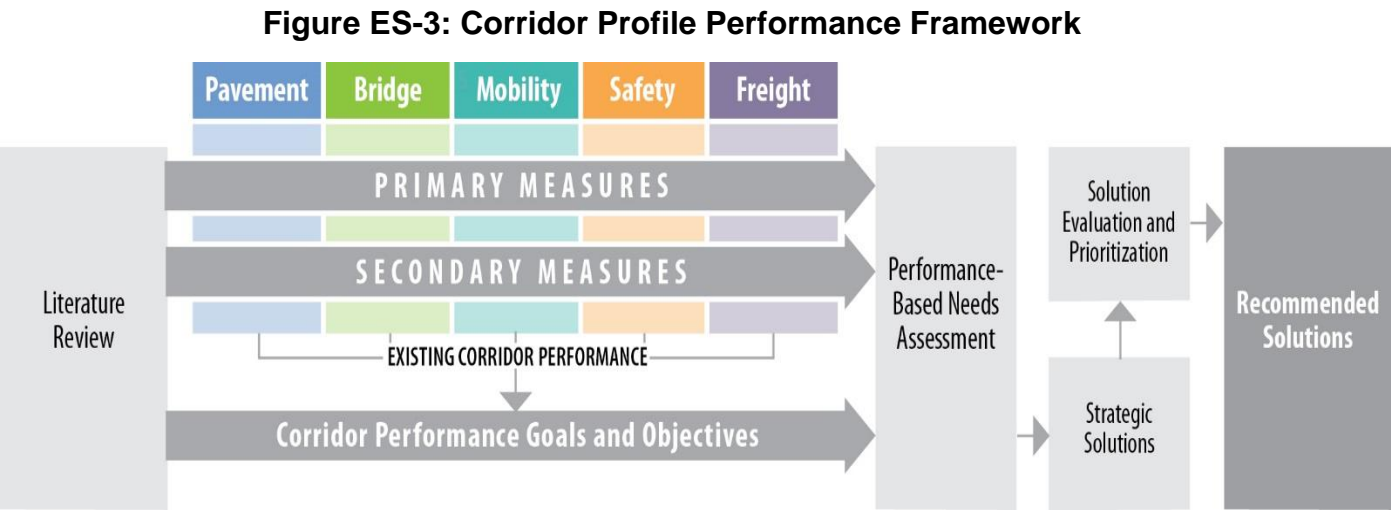
CORRIDOR PERFORMANCE

A series of performance measures are used to assess the I-8 corridor. The results of the performance evaluation are used to define corridor needs relative to the long-term goals and objectives for the corridor.

Corridor Performance Framework

This study uses a performance-based process to define baseline corridor performance, diagnose corridor needs, develop corridor solutions, and prioritize strategic corridor investments. In support of this objective, a framework for the performance-based process was developed through a collaborative process involving ADOT and the CPS consultant teams.

Figure ES-3 illustrates the performance framework, which includes a two-tiered system of performance measures (primary and secondary) to evaluate baseline performance.



The following five performance areas guide the performance-based corridor analyses:

- Pavement
- Bridge
- Mobility
- Safety
- Freight

The performance measures include five primary measures: Pavement Index, Bridge Index, Mobility Index, Safety Index, and Freight Index. Additionally, a set of secondary performance measures provides for a more detailed analysis of corridor performance. **Table ES-1** provides the complete list of primary and secondary performance measures for each of the five performance areas.

Table ES-1: Corridor Performance Measures

Performance Area	Primary Measure	Secondary Measures
Pavement	Pavement Index Based on a combination of International Roughness Index and cracking	<ul style="list-style-type: none"> • Directional Pavement Serviceability • Pavement Failure • Pavement Hot Spots
Bridge	Bridge Index Based on lowest of deck, substructure, superstructure and structural evaluation rating	<ul style="list-style-type: none"> • Bridge Sufficiency • Functionally Obsolete Bridges • Bridge Rating • Bridge Hot Spots
Mobility	Mobility Index Based on combination of existing and future daily volume-to-capacity ratios	<ul style="list-style-type: none"> • Future Congestion • Peak Congestion • Travel Time Reliability • Multimodal Opportunities
Safety	Safety Index Based on frequency of fatal and incapacitating injury crashes	<ul style="list-style-type: none"> • Directional Safety Index • Strategic Highway Safety Plan Emphasis Areas • Crash Unit Types • Safety Hot Spots
Freight	Freight Index Based on bi-directional truck planning time index	<ul style="list-style-type: none"> • Recurring Delay • Non-Recurring Delay • Closure Duration • Bridge Vertical Clearance • Bridge Vertical Clearance Hot Spots

Each of the primary and secondary performance measures identified in the table above is comprised of one or more quantifiable indicators. A three-level scale was developed to standardize the performance scale across the five performance areas, with numerical thresholds specific to each performance measure:

Good/Above Average Performance	Rating is above the identified desirable/average range
Fair/Average Performance	Rating is within the identified desirable/average range
Poor/Below Average Performance	Rating is below the identified desirable/average range

The terms “good”, “fair”, and “poor” apply to the Pavement, Bridge, Mobility, and Freight performance measures, which have defined thresholds. The terms “above average”, “average”, and “below average” apply to the Safety performance measures, which have thresholds referenced to statewide averages.

Corridor Performance Summary

Table ES-2 shows a summary of corridor performance for all primary measures and secondary measure indicators for the I-8 corridor. A weighted corridor average rating (based on the length of the segment) was calculated for each primary and secondary measure as shown in **Table ES-2**.

All segments on the I-8 corridor are performing in the Fair/Average or Good/Above Average range in each of the performance areas, with the exception of one segment with a Poor rating for pavement performance.

The following general observations were made related to the performance of the I-8 corridor.

- Pavement Performance:** Pavement performance ranges from Fair to Good throughout the corridor, with the exception of Segment 8-2, which has a Poor rating for the data set analyzed. A pavement preservation project has been completed in this segment subsequent to the data period.
- Bridge Performance:** A total of 115 bridges were included in the evaluation. Bridge performance is Fair throughout the corridor. Two bridges are considered structurally deficient. These include the Eastbound Colorado River Viaduct (MP 0.01) and the Thornton Road TI Underpass (MP 172.55).
- Mobility Performance:** Mobility performance is Good throughout the corridor. I-8 is considered to have two operating environments for evaluating Mobility. These include Urban 4-Lane Freeway and Rural 4-Lane Freeway with less than 25,000 ADT. Both the current and future capacity is considered “Good”.
- Safety Performance:** Safety performance is Above Average except for Segment 8-3 that rates as Average. Examining a five-year time period, there were two fatal crashes and seven incapacitating injury crashes in the urban area. In the rural area, there were 20 fatal crashes and 68 incapacitating injury crashes.
- Freight Performance:** Freight performance is Good throughout the corridor, except for a Fair rating in the urbanized area of Yuma (Segment 8-1). Segment 8-2 experiences some delay associated with the US Customs Border Patrol Checkpoint.
- Overall performance** within all five areas evaluated is predominantly “Good” to “Fair”

Table ES-2: Corridor Performance Summary by Segment and Performance Measure

Segment #	Segment Length (miles)	Pavement Performance Area				Bridge Performance Area				Mobility Performance Area											
		Pavement Index	Directional PSR		% Area Failure	Bridge Index	Sufficiency Rating	% of Deck Area on Functionally Obsolete Bridges	Lowest Bridge Rating	Mobility Index	Future Daily V/C	Existing Peak Hour V/C		Closure Extent (instances/milepost /year/mile)		Directional TTI (all vehicles)		Directional PTI (all vehicles)		% Bicycle Accommodation	% Non-Single Occupancy Vehicle (SOV) Trips
			EB	WB								EB	WB	EB	WB	EB	WB	EB	WB		
8-1 ¹	16.30	4.20	4.28	4.30	15.6%	5.69	87.36	6.6%	4	0.44	0.50	0.32	0.31	0.16	0.24	1.09	1.07	1.42	1.39	100%	12.5%
8-2 ²	5.10	2.31	3.87	4.07	60.0%	5.31	91.38	0%	5	0.32	0.36	0.26	0.23	0.12	0.44	1.05	1.00	1.45	1.12	100%	16.0%
8-3 ²	35.10	3.58	3.74	3.79	12.5%	6.32	95.49	40.8%	6	0.17	0.19	0.09	0.09	0.21	0.19	1.08	1.08	1.23	1.25	100%	9.8%
8-4 ²	23.10	3.68	3.87	3.74	23.9%	6.00	94.00	100.0%	6	0.16	0.17	0.11	0.10	0.03	0.04	1.07	1.06	1.22	1.20	100%	9.3%
8-5 ²	30.80	3.41	3.58	3.55	28.3%	5.90	92.15	58.5%	5	0.21	0.25	0.15	0.15	0.05	0.09	1.07	1.07	1.26	1.22	100%	22.5%
8-6 ²	9.60	4.17	4.01	4.03	0.0%	5.79	93.01	43.8%	5	0.16	0.20	0.13	0.12	0.04	0.08	1.11	1.09	1.41	1.26	100%	19.0%
8-7 ²	27.60	4.11	4.16	4.18	5.4%	6.08	92.59	33.9%	6	0.08	0.09	0.09	0.08	0.04	0.05	1.10	1.09	1.27	1.26	100%	16.8%
8-8 ²	18.90	3.55	3.83	3.75	18.4%	5.90	92.35	38.1%	5	0.09	0.11	0.09	0.08	0.02	0.04	1.08	1.09	1.25	1.24	100%	13.8%
8-9 ²	11.50	3.48	3.40	3.54	37.5%	5.67	88.40	44.4%	4	0.14	0.16	0.13	0.10	0.10	0.02	1.07	1.10	1.27	1.33	100%	12.2%
Weighted Corridor Average		3.69	3.85	3.85	18.8%	5.97	92.48	46.3%	5	0.20	0.23	0.15	0.14	0.08	0.13	1.08	1.07	1.31	1.25	100%	14.7%
SCALE																					
Performance Level		Interstate				All				Urban Rural				All		Uninterrupted				All	
Good/Above Average		> 3.75			< 5%	> 6.5	> 80	< 12%	> 6	< 0.71 (Urban) < 0.56 (Rural)				< 0.22		< 1.15		<1.30		> 90%	> 17%
Fair/Average		3.2 - 3.75			5% - 20%	5.0 - 6.5	50 - 80	12% - 40%	5 – 6	0.71 - 0.89 (Urban) 0.56 - 0.76 (Rural)				0.22 – 0.62		1.15-1.33		1.30-1.50		60% - 90%	11% - 17%
Poor/Below Average		< 3.2			> 20%	< 5.0	< 50	> 40 %	< 5	> 0.89 (Urban) > 0.76 (Rural)				> 0.62		> 1.33		>1.50		< 60%	< 11%

¹ Urban 4 Lane Freeway / Urban or Fringe Urban Operating Environment

² Rural 4 Lane Freeway < 25,000 vpd / Rural Operating Environment

Table ES-2: Corridor Performance Summary by Segment and Performance Measure (continued)

Segment	Segment Length (miles)	Safety Performance Area							Freight Performance Area							
		Safety Index	Directional Safety Index		% of Fatal + Incapacitating Injury Crashes Involving SHSP Top 5 Emphasis Areas Behaviors	% of Fatal + Incapacitating Injury Crashes Involving Trucks	% of Fatal + Incapacitating Injury Crashes Involving Motorcycles	% of Fatal + Incapacitating Injury Crashes Involving Non-Motorized Travelers	Freight Index	Directional TTI (trucks only)		Directional PTI (trucks only)		Closure Duration (mins/milepost closed/year/mile)		Bridge Vertical Clearance (feet)
			EB	WB						EB	WB	EB	WB	EB	WB	
8-1 ¹	16.30	0.23	0.24	0.22	56%	Insufficient Data	Insufficient Data	Insufficient Data	0.71	1.13	1.12	1.40	1.41	28.88	43.90	16.33
8-2 ²	5.10	0.29	0.33	0.25	43%	Insufficient Data	Insufficient Data	Insufficient Data	0.79	1.00	1.06	1.30	1.23	17.23	140.18	16.23
8-3 ²	35.10	0.96	0.95	0.97	59%	Insufficient Data	Insufficient Data	Insufficient Data	0.89	1.04	1.04	1.14	1.11	73.08	28.10	16.20
8-4 ²	23.10	0.61	0.44	0.77	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data	0.90	1.03	1.03	1.12	1.11	5.20	7.68	No Up
8-5 ²	30.80	0.59	0.59	0.59	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data	0.89	1.03	1.04	1.13	1.12	9.07	19.84	No UP
8-6 ²	9.60	0.10	0.06	0.13	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data	0.82	1.06	1.04	1.27	1.17	24.43	21.89	16.63
8-7 ²	27.60	0.68	0.04	1.32	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data	0.89	1.03	1.03	1.13	1.13	13.25	11.42	16.19
8-8 ²	18.90	0.71	0.74	0.68	33%	Insufficient Data	Insufficient Data	Insufficient Data	0.89	1.03	1.03	1.13	1.11	6.29	25.18	16.09
8-9 ²	11.50	0.59	0.21	0.98	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data	0.83	1.04	1.06	1.19	1.23	27.01	1.53	15.86
Weighted Corridor Average		0.53	0.40	0.66	48%				0.86	1.04	1.04	1.17	1.16	25.58	23.73	16.06
SCALE																
Performance Level		Urban 4 Lane Freeway Rural 4 Lane Freeway < 25,000 vpd							Uninterrupted				All			
Good/Above Average		< 0.79 < 0.73			< 49.1% < 42.8%	< 6.8% < 13.2%	< 9.3% < 5.0%	< 4.8% < 1.7%	> 0.77	< 1.15		< 1.30		< 44.18		> 16.5
Fair/Average		0.79 – 1.21 0.73 – 1.27			49.1% - 59.4% 42.8% - 52.9%	6.8% - 10.9% 13.2% - 17.0%	9.3% - 11.5% 5.0% - 8.5%	4.8% - 10.3% 1.7% - 2.5%	0.67 - 0.77	1.15 -1.33		1.30 -1.50		44.18 -124.86		16.0-16.5
Poor/Below Average		> 1.21 > 1.27			> 59.4% > 52.9%	> 10.9% > 17.0%	> 11.5% > 8.5%	> 10.3% > 2.5%	< 0.67	> 1.33		>1.50		> 124.86		< 16.0

¹ Urban 4 Lane Freeway / Urban or Fringe Urban Operating Environment

² Rural 4 Lane Freeway < 25,000 vpd / Rural Operating Environment

Note: "Insufficient Data" indicates there was not enough data available to generate reliable performance ratings

"No UP" indicates no underpasses are present in the segment

NEEDS ASSESSMENT

Corridor Description

I-8, an important national transportation corridor, spans between San Diego, California and Casa Grande, Arizona. In Arizona, I-8 originates at the Colorado River in the City of Yuma and extends approximately 178 miles east, passing through Yuma County and the Town of Wellton, across Gila Bend in Maricopa County, and terminating at the I-10 junction southeast of Casa Grande in Pinal County. Much of the I-8 corridor is rural and undeveloped.

The entire length of I-8 in Arizona is the subject of this CPS. More than a highway, the corridor is a multimodal facility that moves people and freight and connects communities. The corridor serves the growing Sun Corridor in central Arizona, supports freight movement (e.g., by transporting produce from the “lettuce capital of the US” near Yuma), and carries visitors west to the commercial and recreation centers in Western Arizona, Southern California and Mexico.

Corridor Objectives

Statewide goals and performance measures were established by the ADOT Long-Range Transportation Plan (LRTP), 2010-2035. Statewide performance goals that are relevant to I-8 performance areas were identified and corridor goals were then formulated for each of the five performance areas that aligned with the overall statewide goals established by the LRTP. Based on stakeholder input, corridor goals, corridor objectives, and performance results, three “emphasis areas” were identified for the I-8 corridor: Mobility, Safety and Freight.

Taking into account the corridor goals and identified emphasis areas, performance objectives were developed for each quantifiable performance measure that identify the desired level of performance based on the performance scale levels for the overall corridor and for each segment of the corridor. For the performance emphasis areas, the corridor-wide weighted average performance objectives are identified with a higher standard than for the other performance areas.

Achieving corridor and segment performance objectives will help ensure that investments are targeted toward improvements that support the safe and efficient movement of travelers on the corridor. Corridor performance is measured against corridor and segment objectives to determine needs – the gap between observed performance and the performance objectives.

Needs Assessment Process

The performance-based needs assessment evaluates the difference between the baseline performance and the performance objectives for each of the five performance areas used to characterize the health of the corridor: Pavement, Bridge, Mobility, Safety, and Freight. The performance-based needs assessment process is illustrated in **Figure ES-4**.

The needs assessment compares baseline corridor performance with performance objectives to provide a starting point for the identification of performance needs. This mathematical comparison results in an initial need rating of None, Low, Medium, or High for each primary and secondary performance measure. An illustrative example of this process is shown in **Figure ES-5**.

The initial level of need for each segment is refined to account for hot spots and recently completed or under construction projects, resulting in a final level of need for each segment. The final levels of need for each primary and secondary performance measure are combined to produce a weighted final need rating for each segment. A detailed review of available data helps identify contributing factors to the need and if there is a high level of historical investment.

Figure ES-4: Needs Assessment Process

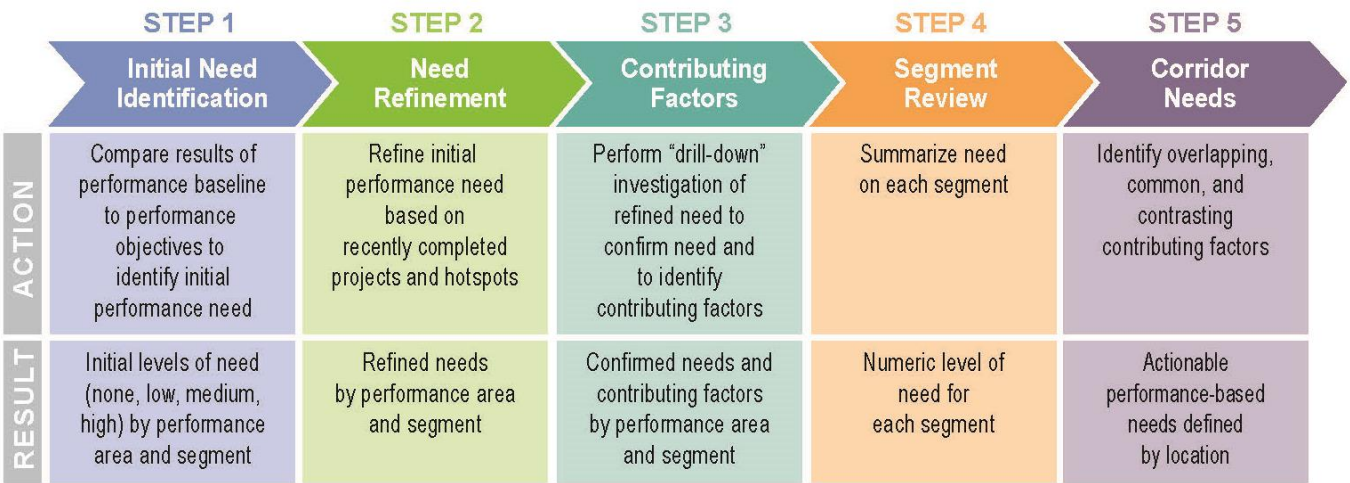


Figure ES-5: Initial Need Ratings in Relation to Baseline Performance (Bridge Example)

Performance Thresholds	Performance Level	Initial Level of Need	Description
6.5	Good	None*	All levels of Good and top 1/3 of Fair (>6.0)
	Good		
	Good		
5.0	Fair	Low	Middle 1/3 of Fair (5.5-6.0)
	Fair		
	Fair	Medium	Lower 1/3 of Fair and top 1/3 of Poor (4.5-5.5)
	Poor		
	Poor	High	Lower 2/3 of Poor (<4.5)
	Poor		

*A segment need rating of ‘None’ does not indicate a lack of needed improvements; rather, it indicates that the segment performance score exceeds the established performance thresholds and strategic solutions for that segment will not be developed as part of this study.

Summary of Needs

Table ES-3 provides a summary of needs for each segment across all performance areas, and the average needs for each segment. A weighting factor of 1.5 is applied to the average need scores of the performance areas identified as emphasis areas (Mobility, Safety, and Freight for the I-8 corridor). All nine segments had an overall Low average need. More information on the identified final needs in each performance area is provided as follows.

Pavement Needs

- Overall Final Pavement needs are Low throughout the corridor.
- One Pavement hot spot in Segment 8-1 was addressed, however a hot spot remains from milepost (MP) 0-1, therefore the need was not changed.
- The Pavement hot spot on Segment 8-2 resulting in a High level of need was addressed by a project in 2014.
- Pavement hot spots within Segment 8-9 were identified, but need reduced from Medium to Low due to projects in 2015, addressing all but one hot spot.

Bridge Needs

- A Low Bridge need occurred on six segments, and Medium level of need on three segments (8-2, 8-5, and 8-9).
- Bridge needs (Low, Medium, or High) were identified on 30 of the 115 bridges along the I-8 corridor (26%).
- Eleven bridges have potential repetitive investment issues. Three of these bridges are also hot spots and were candidates for life-cycle cost analysis to evaluate alternative solutions.
- Two bridges have ratings of 4 (Poor condition).
- Thirteen bridges were defined as hot spots since they had ratings of 5 or lower in multiple areas (deck, substructure, or superstructure). A bridge is considered a hot spot when it has a single rating of 4 or lower or multiple ratings of 5.

Mobility Needs

- The Mobility Performance Area is an emphasis area for the I-8 corridor, giving it a heavier weight in the analysis.
- A Low Mobility need was identified on three segments of I-8, the Yuma urbanized area, Telegraph Pass, and Gila Bend; the remaining segments had no Mobility need to meet performance objectives.
- Contributing factors include frequent congestion and overall higher traffic volumes in the urbanized area, the border patrol checkpoint at MP 18 creating eastbound delays, and closures related to incidents/accidents.
- Additionally, I-8 between MP 18 and MP 21 experiences a reduction in shoulder width to accommodate bicycles.

Safety Needs

- The Safety Performance Area is an emphasis area for the I-8 corridor, giving it a heavier weight in the analysis.
- A Medium Safety need was identified for Segment 8-3, while Low Safety needs were identified in Segments 8-1 and 8-9. The remaining segments meet performance objectives.
- No crash hot spots were identified.
- In the urbanized Yuma area, most incidents/accidents were related to collisions with other motor vehicles, high speeds, and running off the road to the right.
- Outside the urbanized area, many incidents/accidents were single vehicle crashes, and involved the vehicle overturning or running off the road to the left. In these cases, contributing factors were typically driver inattention/distraction and high speeds.
- It has been noted that guardrail could be upgraded corridor-wide, with some sections having been upgraded already as part of pavement preservation projects.

Freight Needs

- The Freight Performance Area is an emphasis area for the I-8 corridor, giving it a heavier weight in the analysis.
- Final Freight needs are Low or None throughout the corridor. In general, limits on truck travel and planning times are not significant factors.
- Freight needs are generally concentrated between MP 0-57 and MP 120-178, that is, the area between Yuma and Mohawk, including Telegraph Pass, and the area between Gila Bend and Casa Grande. The needs related to freight mobility were dispersed throughout these two segments, with elevated levels of delay caused by congestion in the Yuma urbanized area, closures related to incidents/accidents, and bridge clearance issues.
- Urban congestion in the Yuma area impacts freight movement, including high volumes of freight traffic passing through and originating in Yuma.
- Six bridges on the I-8 corridor have mainline vertical clearance restrictions, consisting of less than 16.25' clearance and no ramp around ability.

Overlapping Needs

This section identifies overlapping performance needs on the I-8 corridor, which provides guidance to develop strategic solutions that address more than one performance area with elevated levels of need. Completing projects that address multiple needs presents the opportunity to more effectively improve overall performance. A summary of the overlapping needs that relate to locations with elevated levels of need is provided in the following bullets.

- Overlapping Pavement, Freight, and Mobility needs occur in the Yuma urbanized area, milepost 0-16. Many of the issues are due to high traffic volumes and high volumes of trucks. This section also includes hot spot bridges.
- The area of Telegraph Pass, from approximately milepost 18 to 21, has significant grades and therefore suffers from freight and mobility needs related to delay and incidents/accidents associated with the grade. This area also has locations where climbing and passing lanes might improve safety.
- Milepost 21-57 also has Safety, Pavement, and Freight needs. Incidents/accidents and closures in this area, which may be attributable to pavement and guardrail quality, contribute to safety and freight needs.
- Approaching the Casa Grande urbanized area, MP 148 to MP 178 has needs in the Pavement and Freight areas, with bridges having needs as well as height restrictions related to freight. Thornton Road TI (No. 1196, MP 172.55) has both Bridge and Freight needs.

Table ES-3: Summary of Needs by Segment

Performance Area	Segment Number and Mileposts (MP)								
	8-1	8-2	8-3	8-4	8-5	8-6	8-7	8-8	8-9
	MP 0-16.3	MP 16.3-21.4	MP 21.4-56.5	MP 56.5-79.6	MP 79.6-110.4	MP 110.4-120	MP 120-147.6	MP 147.6-166.5	MP 166.5-178
Pavement	Low	None	Low	Low	Medium	None	None	Low	Low
Bridge	Low	Medium	Low	Low	Medium	Low	Low	Low	Medium
Mobility+	Low	Low	None	None	None	Low	None	None	None
Safety+	Low	None	Medium	None	None	None	Low	None	Low
Freight+	Low	Low	Low	None	None	None	Low	Low	Low
Average Need	1.00	0.77	1.00	0.31	0.62	0.38	0.62	0.54	0.92

*A segment need rating of 'None' does not indicate a lack of needed improvements; rather, it indicates that the segment performance score exceeds the established performance thresholds and strategic solutions for that segment will not be developed as part of this study.

+ Identified as an emphasis area for the I-8 corridor

Average Need Scale	
None*	< 0
Low	0.1-1.0
Medium	1.0-2.0
High	> 2.0

STRATEGIC SOLUTIONS

The principal objective of the CPS is to identify strategic solutions (investments) that are performance-based to ensure that available funding resources are used to maximize the performance of the State’s key transportation corridors. One of the first steps in the development of strategic solutions is to identify areas of elevated levels of need as addressing these needs will have the greatest effect on corridor performance. Segments with Medium or High needs and specific locations of hot spots are considered strategic investment areas for which strategic solutions should be developed. Segments with lower levels of need or without identified hot spots are not considered candidates for strategic investment and are expected to be addressed through other ADOT programming processes. I-8 strategic investment areas (resulting from the elevated needs) are shown in **Figure ES-6**.

Screening Process

In some cases, needs that are identified do not advance to solutions development and are screened out from further consideration because they have been or will be addressed through other measures including:

- A project is programmed to address this need
- The need is a result of a Pavement or Bridge hot spot that does not show historical investment issues; these hot spots will likely be addressed through other ADOT programming means
- A bridge is not a hot spot but is located within a segment with a Medium or High level of need; this bridge will likely be addressed through current ADOT bridge maintenance and preservation programming processes
- The need is determined to be non-actionable (i.e., cannot be addressed through an ADOT project)
- The conditions/characteristics of the location have changed since the performance data was collected that was used to identify the need

Candidate Solutions

For each elevated need within a strategic investment area that is not screened out, a candidate solution is developed to address the identified need. Each candidate solution is assigned to one of the following three P2P investment categories based on the scope of the solution:

- Preservation
- Modernization
- Expansion

Documented performance needs serve as the foundation for developing candidate solutions for corridor preservation, modernization, and expansion. Candidate solutions are not intended to be a substitute or replacement for traditional ADOT project development processes where various ADOT technical groups and districts develop candidate projects for consideration in the performance-based programming in the P2P process. Rather, these candidate solutions are intended to complement ADOT’s traditional project development processes through a performance-based process to address needs in one or more of the five performance areas of Pavement, Bridge, Mobility, Safety, and Freight. Candidate solutions developed for the I-8 corridor will be considered along with other candidate projects in the ADOT statewide programming process.

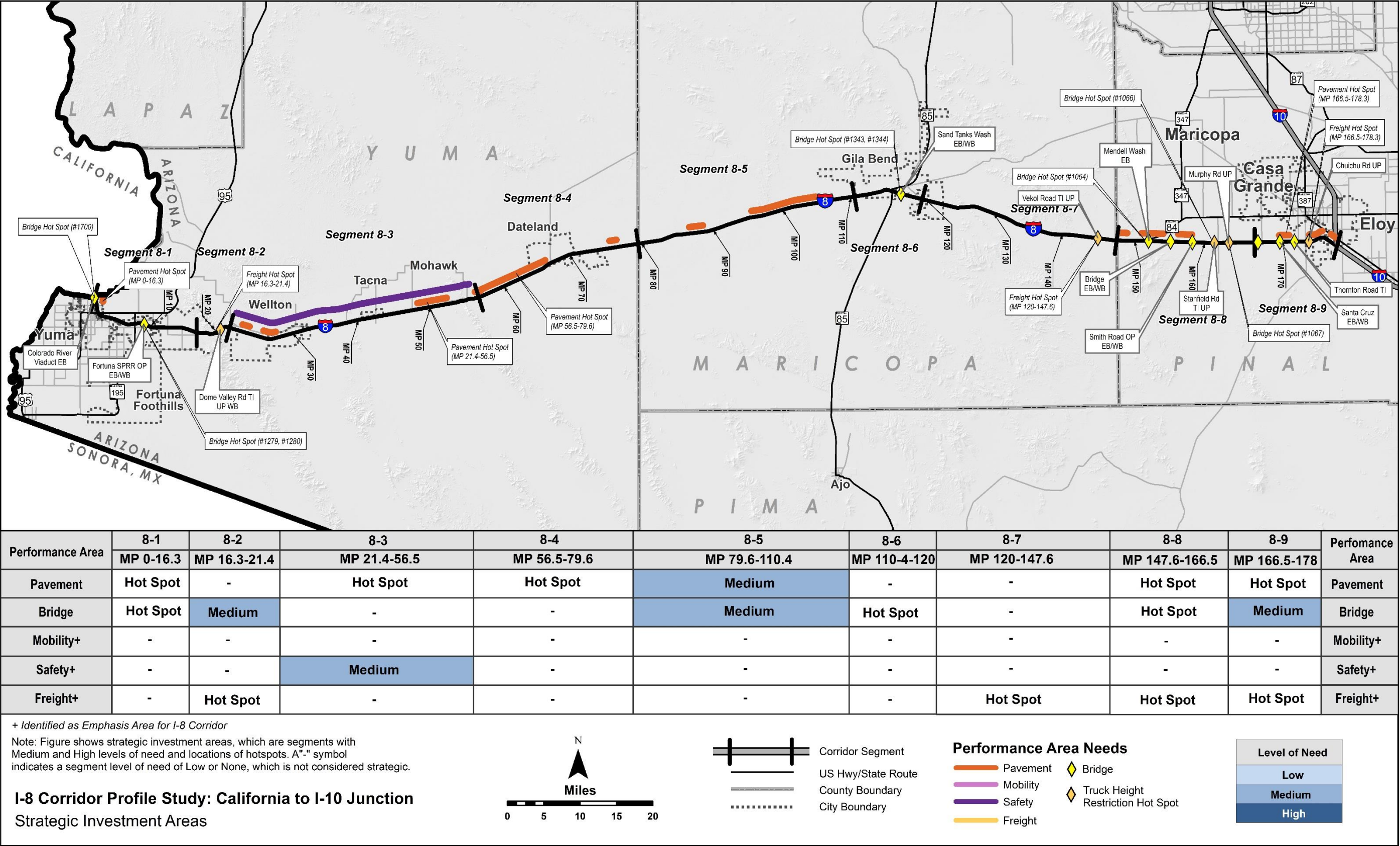
Candidate solutions include some or all of the following characteristics:

- Do not recreate or replace results from normal programming processes
- May include programs or initiatives, areas for further study, and infrastructure projects
- Address elevated levels of need (High or Medium) and hot spots
- Focus on investments in modernization projects (to optimize current infrastructure)
- Address overlapping needs
- Reduce costly repetitive maintenance
- Extend operational life of system and delay expansion
- Leverage programmed projects that can be expanded to address other strategic elements
- Provide measurable benefit

Candidate solutions developed to address an elevated need in the Pavement or Bridge performance areas include two options; rehabilitation or full replacement. These solutions are initially evaluated through a Life-Cycle Cost Analysis (LCCA) to provide insights into the cost-effectiveness of these options so a recommended approach can be identified. Candidate solutions developed to address an elevated need in the Mobility, Safety, or Freight performance areas are advanced directly to the Performance Effectiveness Evaluation. In some cases, there may be multiple solutions identified to address the same area of need.

Candidate solutions that are recommended to expand or modify the scope of an already programmed project are noted and are not advanced to solution evaluation and prioritization. These solutions are directly recommended for programming.

Figure ES-6: Strategic Investment Areas



SOLUTION EVALUATION AND PRIORITIZATION

Candidate solutions are evaluated using the following steps: LCCA (where applicable), Performance Effectiveness Evaluation, Solution Risk Analysis, and Candidate Solution Prioritization. The methodology and approach to this evaluation are shown in **Figure ES-7** and described more fully below.

Life-Cycle Cost Analysis

All Pavement and Bridge candidate solutions have two options: rehabilitation/repair or reconstruction. These options are evaluated through an LCCA to determine the best approach for each location where a Pavement or Bridge solution is recommended. The LCCA eliminates options from further consideration and identify which options should be carried forward for further evaluation.

All Mobility, Safety, and Freight strategic investment areas that result in multiple independent candidate solutions are advanced directly to the Performance Effectiveness Evaluation.

Performance Effectiveness Evaluation

After completing the LCCA process, all remaining candidate solutions are evaluated based on their performance effectiveness. This process includes determining a Performance Effectiveness Score (PES) based on how much each solution impacts the existing performance and needs scores for each segment. This evaluation also includes a Performance Area Risk Analysis to help differentiate between similar solutions based on factors that are not directly addressed in the performance system.

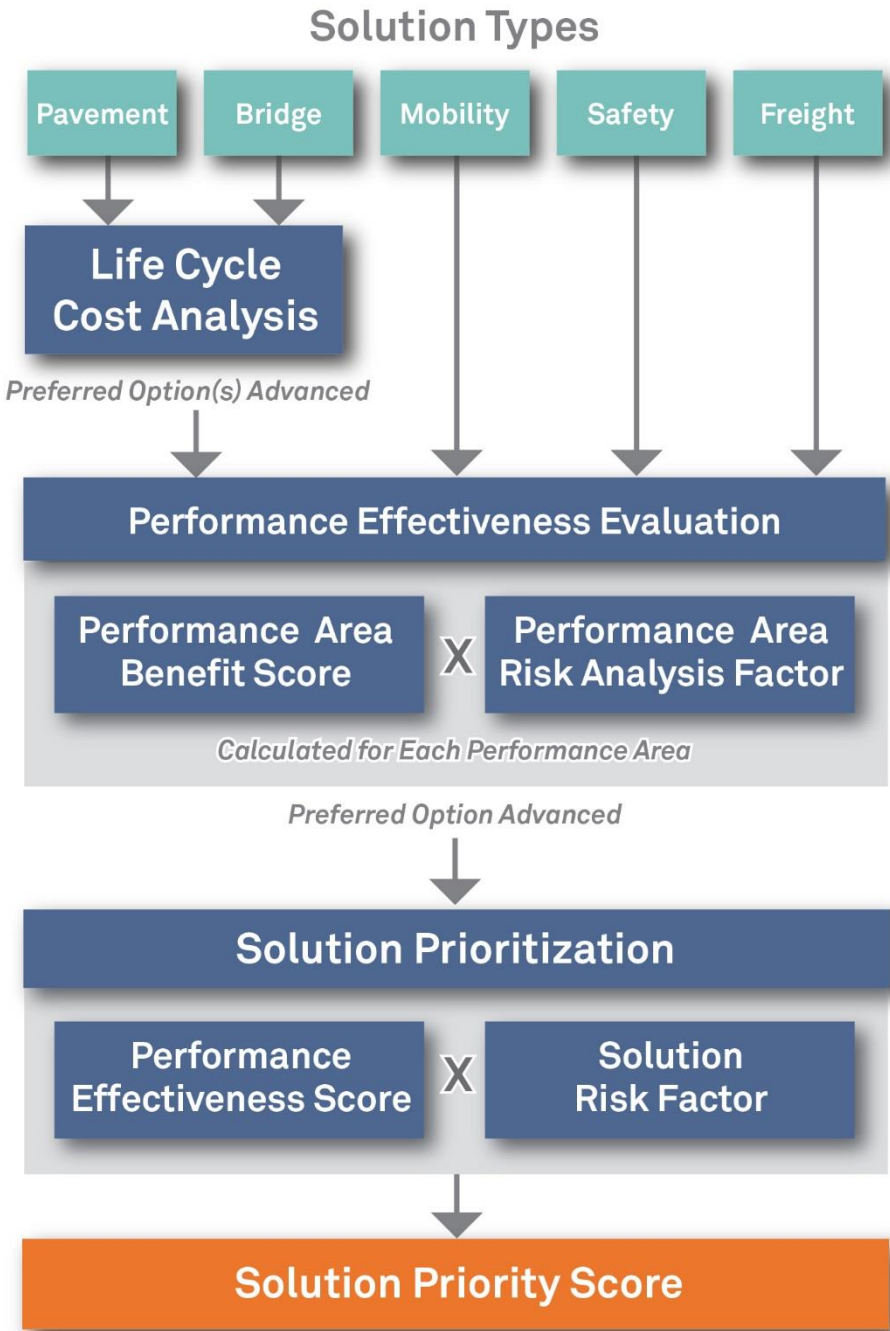
Solution Risk Analysis

All candidate solutions advanced through the Performance Effectiveness Evaluation are also evaluated through a Solution Risk Analysis process. A solution risk probability and consequence analysis is conducted to develop a solution-level risk weighting factor. This risk analysis is a numeric scoring system to help address the risk of not implementing a solution based on the likelihood and severity of the performance failure.

Candidate Solution Prioritization

The PES, weighted risk factor, and segment average need score are combined to create a prioritization score. The candidate solutions are ranked by prioritization score from highest to lowest. The highest prioritization score indicates the candidate solution that is recommended as the highest priority. Solutions that address multiple performance areas tend to score higher in this process.

Figure ES-7: Candidate Solution Evaluation Process



SUMMARY OF CORRIDOR RECOMMENDATIONS

Table ES-4 and **Figure ES-8** show the prioritized candidate solutions recommended for the I-8 corridor. These solutions will increase the performance of the I-8 corridor primarily in the Freight Performance Area. Solutions that address multiple performance areas tend to score higher in this process. Other findings include:

- In the context of the eleven corridors assessed in the corridor profile program, the solutions for I-8 do not score high since the need level is Low in all performance areas.
- Candidate Solution 8.9 Chuichu Rd UP (#1197) Bridge Vertical Clearance Mitigation ranked highest on the corridor due to a reduction in both Freight and Pavement needs at a relatively low cost. Thornton Rd TI UP (#1196) Bridge Vertical Clearance Mitigation also ranked near the top of the corridor list.
- Several sections of I-8 roadway considered pavement hot spots will not be improved by any currently programmed projects. It is anticipated that other preservation programming processes will address these needs in the future.

Other Corridor Recommendations

As part of the investigation of strategic investment areas and candidate solutions, other corridor solutions were also identified that are compatible with the long range vision to support international and inter-regional truck and freight movements:

- Consider a corridor strategy to upgrade all bridges to current standards in anticipation of increased truck/freight traffic over mid to long term.
- Consider corridor-wide ITS solutions to assist truck/freight traffic over the mid to long term.

Policy and Initiative Recommendations

In addition to location-specific needs, general corridor and system-wide needs have also been identified through the CPS process. While these needs are more overarching and cannot be individually evaluated through the CPS process, it is important to document them. A list of recommended policies and initiatives was developed for consideration when programming future projects not only on I-8, but across the entire state highway system where conditions are applicable. The following list, which is in no particular order of priority, was derived from the Round 1, Round 2, and Round 3 CPS:

- Install Intelligent Transportation System (ITS) conduit with all new infrastructure projects
- Prepare strategic plans for Closed Circuit Television (CCTV) camera and Road Weather Information System (RWIS) locations statewide
- Leverage power and communication at existing weigh-in-motion (WIM), dynamic messaging signs (DMS), and call box locations to expand ITS applications across the state
- Consider solar power for lighting and ITS where applicable
- Investigate ice formation prediction technology where applicable
- Conduct highway safety manual evaluation for all future programmed projects
- Develop infrastructure maintenance and preservation plans (including schedule and funding) for all pavement and bridge infrastructure replacement or expansion projects

- Develop standardized bridge maintenance procedures so districts can do routine maintenance work
- Review historical ratings and level of previous investment during scoping of pavement and bridge projects; in pavement locations that warrant further investigation, conduct subsurface investigations during project scoping to determine if full replacement is warranted
- For pavement rehabilitation projects, enhance the amount/level of geotechnical investigations to address issues specific to the varying conditions along the project
- Expand programmed and future pavement projects as necessary to include shoulders
- Expand median cable barrier guidelines to account for safety performance
- Install CCTV cameras with all DMS
- In locations with limited communications, use CCTV cameras to provide still images rather than streaming video
- Develop statewide program for pavement replacement
- Install additional continuous permanent count stations along strategic corridors to enhance traffic count data
- When reconstruction or rehabilitation activities will affect existing bridge vertical clearance, the dimension of the new bridge vertical clearance should be a minimum of 16.25 feet where feasible
- All new or reconstructed roadway/shoulder edges adjacent to an unpaved surface should be constructed with a Safety Edge
- Collision data on tribal lands may be incomplete or inconsistent; additional coordination for data on tribal lands is recommended to ensure adequate reflection of safety issues
- Expand data collection devices statewide to measure freight delay
- Evaluate and accommodate potential changes in freight and goods movement trends that may result from improvements and expansions to the state roadway network

Next Steps

Candidate solutions developed for the I-8 corridor will be considered along with other candidate projects in the ADOT statewide programming process. It is important to note that the candidate solutions are intended to represent strategic solutions to address existing performance needs related to the Pavement, Bridge, Mobility, Safety, and Freight performance areas. Therefore, the strategic solutions are not intended to preclude recommendations related to the ultimate vision for the corridor that may have been defined in the context of prior planning studies and/or design concept reports. Recommendations from such studies are still relevant to addressing the ultimate corridor objectives.

Upon completion of all three CPS rounds, the results will be incorporated into a summary document comparing all corridors that is expected to provide a performance-based review of statewide needs and candidate solutions.

Table ES-4: Prioritized Recommended Solutions

Rank	Candidate Solution #	Option	Candidate Solution Name	Candidate Solution Scope	Estimated Cost (\$ million)	Investment Category [P] Preservation [M] Modernization [E]Expansion	Prioritization Score
1	CS8.9	A	Chuichu Rd UP (#1197) Bridge Vertical Clearance Mitigation	Re-profile roadway to achieve 16.5 feet vertical clearance	\$0.9	M	12
		B	Chuichu Rd UP (#1197) Bridge Vertical Clearance Mitigation	Replace bridge to achieve 16.5 feet vertical clearance	\$2.6	M	3
2	CS8.8	A	Thornton Rd TI UP (#1196) Bridge Vertical Clearance Mitigation	Rehabilitate the bridge Re-profile roadway to achieve 16.5 feet vertical clearance	\$2.9	M	8
		B	Thornton Rd TI UP (#1196) Bridge Vertical Clearance Mitigation	Replace bridge to achieve 16.5 feet vertical clearance	\$3.4	M	3
3	CS8.10	-	Wellton-Mohawk Safety Improvements	Speed Feedback Signs (EB MP 28, EB MP 40, EB MP 45, EB MP 53.75, WB MP 23, WB MP 31.5, WB MP 44, WB MP 56.5) Install Lighting (WB MP 25-25.49, WB MP 27.5-27.99, WB MP 32-33, WB MP 35 - 35.49, EB MP 26 - 26.49, WB MP 45.5-45.99)	\$2.8	M	8
4	CS8.2	B	Dome Valley Rd TI WB UP (#1325) Bridge Vertical Clearance Mitigation	Replace bridge to achieve 16.5 feet vertical clearance	\$1.8	M	3
		A	Dome Valley Rd TI WB UP (#1325) Bridge Vertical Clearance Mitigation	Re-profile roadway to achieve 16.5 feet vertical clearance	\$0.3	M	2
5	CS8.6	A	Stanfield Rd TI UP (#1090) Bridge Vertical Clearance Mitigation	Re-profile roadway to achieve 16.5 feet vertical clearance	\$0.8	M	1
		B	Stanfield Rd TI UP (#1090) Bridge Vertical Clearance Mitigation	Replace bridge to achieve 16.5 feet vertical clearance	\$2.2	M	1
6	CS8.7	A	Murphy Rd UP (#1091) Bridge Vertical Clearance Mitigation	Re-profile roadway to achieve 16.5 feet vertical clearance	\$0.6	M	1
		B	Murphy Rd UP (#1091) Bridge Vertical Clearance Mitigation	Replace bridge to achieve 16.5 feet vertical clearance	\$2.6	M	1
7	CS8.3	B	Vekol Road TI UP (#550) Bridge Vertical Clearance Mitigation	Replace bridge to achieve 16.5 feet vertical clearance	\$2.2	M	1
		A	Vekol Road TI UP (#550) Bridge Vertical Clearance Mitigation	Re-profile roadway to achieve 16.5 feet vertical clearance	\$0.6	M	1

Figure ES-8: Prioritized Recommended Solutions

